



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/617,128	07/11/2003	Itaru Kanno	402696	2934

23548 7590 09/29/2005
LEYDIG VOIT & MAYER, LTD
700 THIRTEENTH ST. NW
SUITE 300
WASHINGTON, DC 20005-3960

EXAMINER

WEBB, GREGORY E

ART UNIT	PAPER NUMBER
----------	--------------

1751

DATE MAILED: 09/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/617,128	Applicant(s) KANNO ET AL.	
	Examiner Gregory E. Webb	Art Unit 1751	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 July 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>71305, 63005, 11105, 71103 AW</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 1-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanabe (US5968848).

Concerning the salt of hydrofluoric acid, Tanabe teaches the following:

Art Unit: 1751

an ingredient (a) comprising a salt of hydrofluoric acid and a metallic-ion-free base;(see claim 2)

Concerning the preferred hydrofluoric salt, Tanabe teaches the following:

4. The process for treating a substrate according to claim 2 or 3, wherein said ingredient (a) is ammonium fluoride, and said ingredient (b) is dimethylsulfoxide.(see claim 4)

Concerning the base not containing a metal, organic amine compound, claimed hydroxylamine, primary fatty amine, alicyclic amine, heterocyclic amine and the aromatic amine, Tanabe teaches the following:

Typical examples of hydroxylamines include hydroxylamine and N,N-diethylhydroxylamine. Typical examples of primary aliphatic amines include monoethanolamine, ethylenediamine, and 2-(2-aminoethylamino)ethanol. Typical examples of secondary amines include diethanolamine, dipropylamine, and 2-ethylaminoethanol. Typical examples of tertiary amines include dimethylaminoethanol, and ethyldiethanolamine. Typical examples of alicyclic amines include cyclohexylamine, and dicyclohexylamine. Typical examples of aromatic amines include benzylamine, dibenzylamine, and N-methylbenzylamine. Typical examples of heterocyclic amines include pyrrole, pyrrolidine, pyrrolidone, pyridine, morpholine, pyrazine, piperidine, N-hydroxyethylpiperidine, oxazole, and thiazole. Further, typical examples of lower-alkyl quaternary ammonium bases include tetramethylammonium hydroxide,

Art Unit: 1751

trimethyl(2-hydroxyethyl)ammonium hydroxide(choline). Among these, aqueous ammonia, monoethanolamine, and tetramethylammonium hydroxide are preferred since they can be easily obtained and are safer.(see col. 4, lines 28-48)

Concerning the pH, Tanabe teaches the compositions to have a pH between 5 and 8 (see col. 4, lines 56-60)

Concerning the claimed inhibitor and the triazoles, Tanabe teaches the following:

Examples of triazole compounds include benzotriazole, o-tolyltriazole, m-tolyltriazole, p-tolyltriazole, carboxybenzotriazole, 1-hydroxytriazole, nitrobenzotriazole, and dihydroxypropylbenzotriazole. Among these, benzotriazole is preferred.(see col. 7, lines 22-25)

Concerning the claimed amide, Tanabe teaches the following:

amides such as N,N-dimethylformamide, N-methylformamide,

N,N-dimethylacetamide, N-methylacetamide, and N,N-diethylacetamide;(see col. 6, lines 16-20)

Concerning the polyhydric alcohol, Tanabe teaches the following:

polyhydric alcohols and derivatives thereof such as ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, ethylene glycol monobutyl ether, ethylene glycol monomethyl ether acetate, ethylene glycol monoethyl ether acetate, diethylene glycol, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, and diethylene glycol monobutyl ether.(see col. 6, lines 28-34)

Art Unit: 1751

Concerning the claimed aliphatic acids, aliphatic carboxylic acids and the amino carboxylic acids, Tanabe teaches the following:

Examples of carboxyl-group-containing organic compounds and anhydrides

thereof include formic acid, acetic acid, propionic acid, butyric acid,

isobutyric acid, oxalic acid, malonic acid, succinic acid, glutaric acid,

maleic acid, fumaric acid, benzoic acid, phthalic acid,

1,2,3-benzenetricarboxylic acid, glycolic acid, lactic acid, malic acid,

citric acid, acetic anhydride, phthalic anhydride, maleic anhydride,

succinic anhydride, and salicylic acid. Formic acid, phthalic acid,

benzoic acid, phthalic anhydride, and salicylic acid are the preferred

carboxyl-group-containing organic compounds. Phthalic anhydride and

salicylic acid are especially preferred.(see col. 7, lines 10-20)

Concerning the aromatic acid and the aromatic carboxylic acids, Tanabe teaches the following:

Typical examples of such aromatic hydroxy compounds include phenol, cresol,

xlenol, pyrocatechol, resorcinol, hydroquinone, pyrogallol,

1,2,4-benzenetriol, salicyl alcohol, p-hydroxybenzyl alcohol,

o-hydroxybenzyl alcohol, p-hydroxyphenetyl alcohol, p-aminophenol,

m-aminophenol, diaminophenol, aminoresorcinol, p-hydroxybenzoic acid,

o-hydroxybenzoic acid, 2,4-dihydroxybenzoic acid, 2,5-dihydroxybenzoic

acid, 3,4-dihydroxybenzoic acid, and 3,5-dihydroxybenzoic acid. Among

these, pyrocatechol is preferred.(see cols. 6-7)

Concerning the sulfoxides, Tanabe teaches the following:

Art Unit: 1751

8. The process for treating a substrate according to claim 5, wherein said aprotic polar solvents are dimethyl sulfoxide, N,N-dimethylformamide, N,N-dimethylacetamide, N-methyl-2-pyrrolidone, and 1,3-dimethyl-2-imidazolidinone.(see claim 8)

Concerning the sulfones, Tanabe teaches the following:

sulfones such as dimethyl sulfone, diethyl sulfone, bis(2-hydroxyethyl) sulfone, and tetramethylene sulfone;(see col. 6, lines 14-20)

Concerning the lactones, Tanabe teaches the following:

lactones such as .gamma.-butyrolactone, and .delta.-valerolactone; and(see col. 6, lines 25-26)

Concerning the dry etching, Tanabe teaches the following:

The substrate thus masked with resist pattern is dry-etched. In case where no ashing process is applied, a waste resist film is removed with a remover solution. Alternatively, in case where an ashing process follows dry etching, a degenerated resist film to which by-product of dry etching adhered is removed with a remover solution.(see col. 3, lines 44-55)

Concerning the gas plasma processing, Tanabe teaches the following:

Silicon wafers each having a vapor-deposited Al--Si--Cu film with a thickness of approximately 1.0 .mu.m were spinner-coated with a positive photoresist, THMR-iP3300 (manufactured by Tokyo Ohka Kogyo Co., Ltd.), consisting principally of a naphtoquinonediazide compound and a novolak resin, and then pre-baked at 90.degree. C. for 90 seconds. to form a resist film on each wafer with a thickness of 2.0 .mu.m. Each resist film

Art Unit: 1751

was exposed through a mask pattern using an aligner, NSR-2005i10D (manufactured by Nikon Corporation), and then developed with a 2.38% by weight tetramethylammonium hydroxide aqueous solution to form a resist pattern. Subsequently, post-baking was performed at 120.degree. C. for 90 seconds.(see examples)

Claims 1-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanabe (US5792274).

Concerning the salt of hydrofluoric acid, base not containing a metal, organic amine compound and the lower quaternary ammonium base, Tanabe teaches the following:

TMAH.HF: tetramethylammonium hydroxide salt of hydrofluoric acid (see table 1)

Concerning the preferred hydrofluoric salt, Tanabe teaches the following:

4. The method as claimed in claim 1, wherein component (a) is ammonium fluoride.(see claim 4)

Concerning the hydrogen ion concentration, Tanabe teaches the composition to have a pH of between 5 and 8 (see col. 2, lines 59-65)

Concerning the claimed inhibitor and the triazoles, Tanabe teaches the following:

Examples of the triazole compounds include benzotriazole, o-tolyltriazole, m-tolyltriazole, p-tolyltriazole, carboxybenzotriazole, 1-hydroxybenzotriazole, nitrobenzotriazole, and dihydroxypropylbenzotriazole. Among these, preferred is benzotriazole.(see col. 5, lines 34-

40)

Art Unit: 1751

Concerning the semiconductor device and the metal film having copper, Tanabe teaches the following:

Semiconductor elements such as IC's and LSI's and liquid-crystal panel elements are produced by evenly applying a photoresist to an electroconductive film of a metal, e.g., aluminum, copper, or an aluminum alloy, formed on a substrate or to an insulating film, e.g., SiO.sub.2 film, formed on a substrate, light-exposing the resist layer or drawing an image thereon with an electron beam, subsequently developing the resist layer to form a resist pattern, selectively etching the electroconductive metal film or insulating film using the pattern as a mask to form a fine circuit, and then removing the unnecessary resist layer with a remover solution.(see col. 1, lines 18-30)

Concerning the resist, Tanabe teaches the following:

Furthermore, this and other objects of the present invention have been accomplished by a method for removing resist which comprises the steps of: (I) forming a resist layer on a substrate having a metal film, (II) light-exposing the resist layer through a mask pattern and subsequently developing the resist layer to form a resist pattern, and (III) dry-etching the substrate using the resist pattern as a mask and then removing the unnecessary resist and modified resist film with the above-described remover solution composition for resist.(see cols. 2-3)

Concerning the claimed hydroxylamine and the ammonium salt, Tanabe teaches the following:

Art Unit: 1751

3. The method as claimed in claim 1, wherein component (a) is a salt of hydrofluoric acid with at least one metal-free base selected from hydroxylamines; primary, secondary, or tertiary aliphatic alicyclic, aromatic and heterocyclic amines; ammonia water; and C.sub.1 to C.sub.4 lower alkyl quaternary ammonium salt groups.(see claim 3)

Concerning the primary fatty amine, alicyclic amine, heterocyclic amine and the aromatic amine, Tanabe teaches the following:

As described above, the remover solution composition for resist of the present invention (hereinafter often simply referred to as "the composition of the present invention") contains (a) a salt of hydrofluoric acid with a metal-free base. The term "metal-free base" as used herein means a base containing no metal in the molecule and include hydroxylamines, organic amines (e.g., primary, secondary, or tertiary aliphatic, alicyclic, aromatic, and heterocyclic amines), ammonia water, and lower alkyl quaternary ammonium salt groups (the term "lower alkyl" as used herein means "alkyl having from 1 to 4 carbon atoms (C.sub.1 to C.sub.4)"). Examples of the hydroxylamines include hydroxylamine and N,N-diethylhydroxylamine. Examples of the primary aliphatic amines include monoethanolamine, ethylenediamine, and 2-(2-aminoethylamino)ethanol. Examples of the secondary aliphatic amines include diethanolamine, dipropylamine, and 2-ethylaminoethanol. Examples of the tertiary aliphatic amines include dimethylaminoethanol and ethyldiethanolamine. Examples of

Art Unit: 1751

the alicyclic amines include cyclohexylamine and dicyclohexylamine.

Examples of the aromatic amines include benzylamine, dibenzylamine, and N-methylbenzylamine. Examples of the heterocyclic amines include pyrrole,

pyrrolidine, pyrrolidone, pyridine, morpholine, pyrazine, piperidine,

N-hydroxyethylpiperidine, oxazole, and thiazole. Examples of the C.sub.1

to C.sub.4 lower alkyl quaternary ammonium salt groups include

tetramethylammonium hydroxide and trimethyl(2-hydroxyethyl)-ammonium

hydroxide (choline). Preferred metal-free bases are ammonia water,

monoethanolamine, and tetramethylammonium hydroxide, because these bases

are easily available and safe. A salt of the metal-free base with

hydrofluoric acid can be produced by adding the metal-free base to

commercial hydrofluoric acid having a hydrogen fluoride concentration of

50 to 60% in such a proportion as to result in a pH of 5 to 8. Commercial

ammonium fluoride is, of course, usable as the salt.(see col. 3)

Concerning the claimed amide, polyhydric alcohol, sulfoxides, sulfones and the lactones, Tanabe teaches the following:

Any organic solvent may be used as component (b) in the present invention, as long as it is miscible with components (a), (c), and (d). Water-soluble organic solvents used in conventional organic amine-based remover solution compositions may be used. Examples of the water-soluble organic solvents include sulfoxides (e.g., dimethyl sulfoxide), sulfones (e.g., dimethyl sulfone, diethyl sulfone, bis(2-hydroxyethyl) sulfone, tetramethylene

Art Unit: 1751

sulfone), amides (e.g., N,N-dimethylformamide, N-methylformamide, N,N-dimethylacetamide, N-methylacetamide, N,N-diethylacetamide), lactams (e.g., N-methyl-2-pyrrolidone, N-ethyl-2-pyrrolidone, N-propyl-2-pyrrolidone, N-hydroxymethyl-2-pyrrolidone, N-hydroxyethyl-2-pyrrolidone), imidazolidinones (e.g., 1,3-dimethyl-2-imidazolidinone, 1,3-diethyl-2-imidazolidinone, 1,3-diisopropyl-2-imidazolidinone), lactones (e.g., γ -butyrolactone, δ -valerolactone), and polyhydric alcohols (e.g., ethylene glycol, ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, ethylene glycol monobutyl ether, ethylene glycol monomethyl ether acetate, ethylene glycol monoethyl ether acetate, diethylene glycol, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, diethylene glycol monobutyl ether); and derivatives thereof. Among these, preferred are dimethyl sulfoxide, N,N-dimethylformamide, N,N-dimethylacetamide, N-methyl-2-pyrrolidone, 1,3-dimethyl-2-imidazolidinone, ethylene glycol, and diethylene glycol monobutyl ether, because these solvents bring about the removability of modified resist films. In particular, use of a water-soluble organic solvent comprising at least 10% by weight (wt %) ethylene glycol as component (b) is preferred in that the composition of the present invention containing this component (b) is highly inhibited from corroding a metal deposition substrate in the removing of a holed resist pattern. In this case, ethylene glycol alone may be used as

Art Unit: 1751

component (b) because the higher the ethylene glycol content, the higher the anticorrosive effect. A mixture of 40 to 60 wt % of ethylene glycol and 60 to 40 wt % of dimethyl sulfoxide is also advantageous.(see col. 4, lines 5-43)

Concerning the claimed aliphatic acids, aromatic acid, aliphatic carboxylic acids, aromatic carboxylic acids and the amino carboxylic acids, Tanabe teaches the following:

Examples of the carboxyl group-containing organic compounds and anhydrides thereof include formic acid, acetic acid, propionic acid, butyric acid, isobutyric acid, oxalic acid, malonic acid, succinic acid, glutaric acid, maleic acid, fumaric acid, benzoic acid, phthalic acid, 1,2,3-benzenetricarboxylic acid, glycolic acid, lactic acid, malic acid, citric acid, acetic anhydride, phthalic anhydride, maleic anhydride, succinic anhydride, and salicylic acid. Among these, preferred are formic acid, phthalic acid, benzoic acid, phthalic anhydride, and salicylic acid, and especially preferred are phthalic acid, phthalic anhydride, and salicylic acid.(see col. 5, lines 23-33)

Claims 1-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanabe (US5905063).

Concerning the salt of hydrofluoric acid and the preferred hydrofluoric salt, Tanabe teaches the following:

3. The remover solution composition for resist as claimed in claim 1, wherein component (a) is ammonium fluoride.(see claim 3)

Art Unit: 1751

Concerning the base not containing a metal, organic amine compound, claimed hydroxylamine, primary fatty amine, alicyclic amine, heterocyclic amine and the aromatic amine, Tanabe teaches the following:

As described above, the remover solution composition for resist of the present invention (hereinafter often simply referred to as "the composition of the present invention") contains (a) a salt of hydrofluoric acid with a metal-free base. The term "metal-free base" as used herein means a base containing no metal in the molecule and include hydroxylamines, organic amines (e.g., primary, secondary, or tertiary aliphatic, alicyclic, aromatic, and heterocyclic amines), ammonia water, and lower alkyl quaternary ammonium salt groups (the term "lower alkyl" as used herein means "alkyl" having from 1 to 4 carbon atoms (C.sub.1 to C.sub.4)). Examples of the hydroxylamines include hydroxylamine and N,N-diethylhydroxylamine. Examples of the primary aliphatic amines include monoethanolamine, ethylenediamine, and 2-(2-aminoethylamino)ethanol. Examples of the secondary aliphatic amines include diethanolamine, dipropylamine, and 2-ethylaminoethanol. Examples of the tertiary aliphatic amines include dimethylaminoethanol and ethyldiethanolamine. Examples of the alicyclic amines include cyclohexylamine and dicyclohexylamine. Examples of the aromatic amines include benzylamine, dibenzylamine, and N-methylbenzylamine. Examples of the heterocyclic amines include pyrrole, pyrrolidine, pyrrolidone, pyridine, morpholine, pyrazine, piperidine,

Art Unit: 1751

N-hydroxyethylpiperidine, oxazole, and thiazole. Examples of the C.sub.1 to C.sub.4 lower alkyl quaternary ammonium salt groups include tetramethylammonium hydroxide and trimethyl(2-hydroxyethyl)-ammonium hydroxide (choline). Preferred metal-free bases are ammonia water, monoethanolamine, and tetramethylammonium hydroxide, because these bases are easily available and safe. A salt of the metal-free base with hydrofluoric acid can be produced by adding the metal-free base to commercial hydrofluoric acid having a hydrogen fluoride concentration of 50 to 60% in such a proportion as to result in a pH of 5 to 8. Commercial ammonium fluoride is, of course, usable as the salt.(see col. 3, lines 14-50)

Concerning the claimed inhibitor and the triazoles, Tanabe teaches the following:

Examples of the triazole compounds include benzotriazole, o-tolyltriazole, m-tolyltriazole, p-tolyltriazole, carboxybenzotriazole, 1-hydroxybenzotriazole, nitrobenzotriazole, and dihydroxypropylbenzotriazole. Among these, preferred is benzotriazole.(see col. 5, lines 36-41)

Concerning the lower quaternary ammonium base, Tanabe teaches in table 1 the use of quaternary ammonium compounds including tetramethyl ammonium hydroxide.

Concerning the claimed amide, polyhydric alcohol, sulfoxides, sulfones and the lactones, Tanabe teaches the following:

Any organic solvent may be used as component (b) in the present invention, as long as it is miscible with components (a), (c), and (d). Water-soluble

Art Unit: 1751

organic solvents used in conventional organic amine-based remover solution compositions may be used. Examples of the water-soluble organic solvents include sulfoxides (e.g., dimethyl sulfoxide), sulfones (e.g., dimethyl sulfone, diethyl sulfone, bis(2-hydroxyethyl) sulfone, tetramethylene sulfone), amides (e.g., N,N-dimethylformamide, N-methylformamide, N,N-dimethylacetamide, N-methylacetamide, N,N-diethylacetamide), lactams (e.g., N-methyl-2-pyrrolidone, N-ethyl-2-pyrrolidone, N-propyl-2-pyrrolidone, N-hydroxymethyl-2-pyrrolidone, N-hydroxyethyl-2-pyrrolidone), imidazolidinones (e.g., 1,3-dimethyl-2-imidazolidinone, 1,3-diethyl-2-imidazolidinone, 1,3-diisopropyl-2-imidazolidinone), lactones (e.g., .gamma.-butyrolactone, .delta.-valerolactone), and polyhydric alcohols (e.g., ethylene glycol, ethylene glycol inonomethyl ether, ethylene glycol monoethyl ether, ethylene glycol monobutyl ether, ethylene glycol, monomethyl ether acetate, ethylene glycol monoethyl ether acetate, diethylene glycol, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, diethylene glycol monobutyl ether); and derivatives thereof. Among these, preferred are dimethyl sulfoxide, N,N-dimethylformamide, N,N-dimethylacetamide, N-methyl-2-pyrrolidone, 1,3-dimethyl-2-imidazolidinone, ethylene glycol, and diethylene glycol monobutyl ether, because these solvents bring about the removability of modified resist films. In particular, use of a water-soluble organic

Art Unit: 1751

solvent comprising at least 10% by weight (wt %) ethylene glycol as component (b) is preferred in that the composition of the present invention containing this component (b) is highly inhibited from corroding a metal deposition substrate in the removing of a holed resist pattern. In this case, ethylene glycol alone may be used as component (b) because the higher the ethylene glycol content, the higher the anticorrosive effect. A mixture of 40 to 60 wt % of ethylene glycol and 60 to 40 wt % of dimethyl sulfoxide is also advantageous.(see col. 4, lines 8-45)

Concerning the claimed aliphatic acids, aromatic acid, aliphatic carboxylic acids, aromatic carboxylic acids and the amino carboxylic acids, Tanabe teaches the following:

Examples of the carboxyl group-containing organic compounds and anhydrides thereof include formic acid, acetic acid, propionic acid, butyric acid, isobutyric acid, oxalic acid, malonic acid, succinic acid, glutaric acid, maleic acid, fumaric acid, benzoic acid, phthalic acid, 1,2,3-benzenetricarboxylic acid, glycolic acid, lactic acid, malic acid, citric acid, acetic anhydride, phthalic anhydride, maleic anhydride, succinic anhydride, and salicylic acid. Among these, preferred are formic acid, phthalic acid, benzoic acid, phthalic anhydride, and salicylic acid, and especially preferred are phthalic acid, phthalic anhydride, and salicylic acid.(see col. 5, lines 24-35)

Concerning the ammonium salt, Tanabe teaches the following:

2. The remover solution composition for resist as claimed in claim 1,

Art Unit: 1751

wherein component (a) is a salt of hydrofluoric acid with at least one metal-free base selected from the group consisting of hydroxylamines; primary, secondary, or tertiary aliphatic alicyclic, aromatic and heterocyclic amines; ammonia water; and C.sub.1 to C.sub.4 lower alkyl quaternary ammonium salt groups.(see claim 2)

Claims 1-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanabe (US6068000).

Concerning the salt of hydrofluoric acid, Tanabe teaches the following:

(I) removing the resist pattern using a remover solution principally containing a salt of hydrofluoric acid and a metal-free base;(see col. 2, lines 45-53)

Concerning the preferred hydrofluoric salt, Tanabe teaches the following:

7. The substrate treatment method according to claim 1, wherein said remover solution principally containing a salt derived from hydrofluoric acid and a metal-free base is a remover solution for resists which comprises 0.2 to 10% by weight of ammonium fluoride, 30 to 90% by weight of dimethyl sulfoxide, and 5 to 50% by weight of water.(see claim 7)

Concerning the base not containing a metal, organic amine compound, claimed hydroxylamine, primary fatty amine, alicyclic amine, heterocyclic amine and the aromatic amine, Tanabe teaches the following:

Typically, examples of hydroxylamines include hydroxylamine and

Art Unit: 1751

N,N-diethylhydroxylamine; examples of primary aliphatic amines include monoethanolamine, ethylenediamine, and 2-(2-aminoethylamino)ethanol; examples of secondary aliphatic amines include diethanolamine, dipropylamine, and 2-ethylaminoethanol; examples of tertiary aliphatic amines include dimethylaminoethanol, and ethyldiethanolamine; examples of alicyclic amines include cyclohexylamine, and dicyclohexylamine; examples of aromatic amines include benzylamine, dibenzylamine, and N-methylbenzylamine; and examples of heterocyclic amines include pyrrole, pyrrolidine, pyrrolidone, pyridine, morpholine, pyrazine, piperidine, N-hydroxyethyl piperidine, oxazole, and thiazole. Further, typical examples of quaternary lower alkyl ammonium bases include tetramethylammonium hydroxide, and trimethyl(2-hydroxyethyl)ammonium hydroxide (choline). Among the above-listed compounds, aqueous ammonia, monoethanol amine and tetramethylammonium hydroxide are preferred since they are easily obtainable and superior in safety.(see cols. 4-5)

Concerning the hydrogen ion concentration, Tanabe teaches the following:

The salt derived from hydrofluoric acid and the above-described metal-free base can be prepared by adding a metal-free base to a commercially-available hydrofluoric acid solution of 50 to 60% hydrofluoric acid concentration such that the pH is adjusted to 5 to 8. Needless to say, commercially-available ammonium fluoride can be used as such a salt.(see col. 5, lines 8-14)

Art Unit: 1751

Concerning the claimed inhibitor and the triazoles, Tanabe teaches the following:

Examples of triazoles include benzotriazole, o-tolyltriazole, m-tolyltriazole, p-tolyltriazole, carboxybenzotriazole, 1-hydroxybenzotriazole, nitrobenzotriazole, and dihydroxypropylbenzotriazole. Among these, benzotriazole is preferred.(see col. 4, lines 19-

24)

Concerning the claimed amide and the sulfoxides, Tanabe teaches the following:

5. The substrate treatment method according to claim 2, wherein said aprotic polar solvents include dimethyl sulfoxide, N,N-dimethylformamide, N,N-dimethylacetamide, N-methyl-2-pyrrolidone, and 1,3-dimethyl-2-imidazolidinone.(see claim 5)

Concerning the polyhydric alcohol, sulfones and the lactones, Tanabe teaches the following:

The lithographic rinsing solution used in the present invention is to rinse a substrate for a semiconductor device or a liquid-crystal panel device after the substrate has been treated with a hydrofluoric acid-based remover solution, and is a composition containing a water-soluble organic solvent and water. Examples of such water-soluble organic solvents include monohydric alcohols such as methyl alcohol, ethyl alcohol, and isopropyl alcohol; sulfoxides such as dimethyl sulfoxide; sulfones such as dimethylsulfone, diethylsulfone, bis(2-hydroxyethyl)sulfone, and tetramethylenesulfone; amides such as N,N-dimethylformamide, N-methylformamide, N,N-dimethylacetamide, N-methylacetamide, and

Art Unit: 1751

N,N-diethylacetamide; lactams such as N-methyl-2-pyrrolidone, N-ethyl-2-pyrrolidone, N-propyl-2-pyrrolidone, N-hydroxymethyl-2-pyrrolidone, and N-hydroxyethyl-2-pyrrolidone; imidazolidinones such as 1,3-dimethyl-2-imidazolidinone, 1,3-diethyl-2-imidazolidinone, and 1,3-diisopropyl-2-imidazolidinone; lactones such as .gamma.-butyrolactone, and .delta.-valerolactone; and polyhydric alcohols and derivatives thereof such as ethylene glycol, ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, ethylene glycol monobutyl ether, ethylene glycol monomethyl ether acetate, ethylene glycol monoethyl ether acetate, diethylene glycol, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, and diethylene glycol monobutyl ether. Among these, monohydric alcohol such as methyl alcohol, ethyl alcohol, isopropyl alcohol, aprotic polar solvents such as dimethyl sulfoxide, N,N-dimethylformamide, N,N-dimethylacetamide, N-methyl-2-pyrrolidone and 1,3-dimethyl-2-imidazolidinone, polyhydric alcohols such as ethylene glycol, polyhydric alcohol derivatives such as diethylene glycol monobutyl ether are preferred, and particularly, monohydric alcohols such as methyl alcohol, ethyl alcohol, and isopropyl alcohol are more preferred since rinsing solutions prepared from them can be put into disposal at low cost without any complex treatment after the solutions are used.(see col. 3, lines 1-40)

Art Unit: 1751

Concerning the claimed aliphatic acids, aromatic acid, aliphatic carboxylic acids, aromatic carboxylic acids and the amino carboxylic acids, Tanabe teaches the following:

Examples of carboxyl group-containing organic compounds and anhydrides thereof include formic acid, acetic acid, propionic acid, butyric acid, isobutyric acid, oxalic acid, malonic acid, succinic acid, glutaric acid, maleic acid, fumaric acid, benzoic acid, phthalic acid, 1,2,3-benzenetricarboxylic acid, glycolic acid, lactic acid, malic acid, citric acid, acetic anhydride, phthalic anhydride, maleic anhydride, succinic anhydride, and salicylic acid. Preferred carboxyl group-containing organic compounds are formic acid, phthalic acid, benzoic acid, phthalic anhydride, and salicylic acid, and particularly preferred are phthalic acid, phthalic anhydride, and salicylic acid.(see col. 4, lines 8-19)

Claims 1-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Ikemoto (US6372410).

Concerning the salt of hydrofluoric acid, preferred hydrofluoric salt and the claimed hydroxylamine, Ikemoto teaches the following:

The fluorine compounds usable in the present invention are hydrofluoric acid, ammonium fluorides and amine hydrofluorides including ammonium fluoride, acid ammonium fluoride, methylamine hydrofluoride, ethylamine hydrofluoride, propylamine hydrofluoride, tetramethylammonium fluoride, tetraethylammonium fluoride, ethanolamine hydrofluoride,

Art Unit: 1751

methylethanolamine hydrofluoride, dimethylethanolamine hydrofluoride, hydroxylamine hydrofluoride, dimethylhydroxylamine hydrofluoride, triethylenediamine hydrofluoride, etc. Of these fluorine compounds, ammonium fluoride and tetramethylammonium fluoride are preferred, and ammonium fluoride is more preferred. These fluorine compounds may be used alone or in combination of two or more.(see cols. 2-3)

Concerning the base not containing a metal, organic amine compound and the ammonium salt, Ikemoto teaches the following:

8. The resist stripping composition according to claim 1, wherein the quaternary ammonium salts are selected from the group consisting of tetramethylammonium hydroxide, tetramethylammonium carbonate and tetramethylammonium formate.(see claim 8)

Concerning the claimed inhibitor, Ikemoto teaches the following:

15. The resist stripping composition according to claim 14, wherein the corrosion inhibitor includes at least one of the carboxylic acid-based chelate compounds.(see claim 15)

Concerning the semiconductor device, Ikemoto teaches the following:

23. A process for producing a semiconductor device, comprising:(see claim 23)

Concerning the primary fatty amine, tertiary fatty amine, heterocyclic amine, claimed aliphatic acids, aromatic acid, aliphatic carboxylic acids, aromatic carboxylic acids and the amino carboxylic acids, Ikemoto teaches the following:

10. The resist stripping composition according to claim 1, wherein the

Art Unit: 1751

carboxyl-containing organic compounds are selected from the group consisting of formic acid, acetic acid, propionic acid, butyric acid, isobutyric acid, oxalic acid, malonic acid, succinic acid, glutaric acid, maleic acid, fumaric acid, benzoic acid, phthalic acid, 1,2,3-benzenetricarboxylic acid, glycolic acid, lactic acid, malic acid, citric acid, acetic anhydride, phthalic anhydride, maleic anhydride, succinic anhydride and salicylic acid; and the basic substance is selected from the group consisting of ethanolamine, trimethylamine, diethylamine and pyridine.(see claim 10)

Concerning the polyhydric alcohol, Ikemoto teaches the following:

6. The resist stripping composition according to claim 5, wherein said at least one glycol ether is selected from the group consisting of ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, ethylene glycol monobutyl ether, ethylene glycol dimethyl ether, ethylene glycol diethyl ether, diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, diethylene glycol monopropyl ether, diethylene glycol monoisopropyl ether, diethylene glycol monobutyl ether, diethylene glycol monoisobutyl ether, diethylene glycol monobenzyl ether, diethylene glycol dimethyl ether, diethylene glycol diethyl ether, triethylene glycol monomethyl ether, triethylene glycol dimethyl ether, polyethylene glycol monomethyl ether, diethylene glycol methyl ethyl ether, triethylene glycol, ethylene glycol monomethyl ether acetate, ethylene glycol monoethyl ether acetate,

Art Unit: 1751

propylene glycol monomethyl ether, propylene glycol dimethyl ether, propylene glycol monobutyl ether, dipropylene glycol monomethyl ether, dipropylene glycol monopropyl ether, dipropylene glycol monoisopropyl ether, dipropylene glycol monobutyl ether, dipropylene glycol dimethyl ether, dipropylene glycol dipropyl ether, dipropylene glycol diisopropyl ether, tripropylene glycol and tripropylene glycol monomethyl ether.(see claim 6)

Concerning the claimed inorganic acids, Ikemoto teaches the following:

13. The resist stripping composition according to claim 12, wherein the corrosion inhibitor includes at least one of the phosphoric acid-based chelate compounds.(see claim 13)

Concerning the diethylene triamine penta (methylene phosphonic acid), Ikemoto teaches the following:

12. The resist stripping composition according to claim 1, wherein the phosphoric acid-based chelate compounds are selected from the group consisting of 1,2-propanediaminetetramethylene phosphonic acid and hydroxyethane phosphonic acid.(see claim 12)

Claims 1-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Hsu, Chien-Pin Sherman (US20040152608).

Art Unit: 1751

Concerning the salt of hydrofluoric acid and the preferred hydrofluoric salt, Hsu, Chien-Pin

Sherman teaches the following:

[0021] The cleaning compositions may also optionally contain fluoride compounds in cleaning composition, such as for example, tetramethylammonium fluoride, tetrabutylammonium fluoride, and ammonium fluoride. Other suitable fluorides include, for example fluoroborates, tetrabutylammonium fluoroborates, aluminum hexafluorides, antimony fluoride and the like. The fluoride components will be present in an amount of from 0 to 10 wt. %, preferably from about 0.1 to 5 wt. %.

Concerning the base not containing a metal, organic amine compound, semiconductor device and the metal film having copper, Hsu, Chien-Pin Sherman teaches the following:

[0008] It has been discovered that ammonia (NH_3) and ammonia-derived bases such as ammonium hydroxide and other salts (NH_4X , $\text{X}=\text{OH}$, carbonate, etc.) are capable of dissolving/corroding metals such as copper through complex formation. Thus they are poor choices to be used in semiconductor cleaning formulations when compatibility with porous, low- κ and high- κ dielectrics and copper metallizations are required. These compounds can generate ammonia through equilibrium process. Ammonia can form complex with metals such as copper and result in metal corrosion/dissolution as set forth in the following equations.

Concerning the resist, dry etching and the gas plasma processing, Hsu, Chien-Pin Sherman teaches the following:

[0002] Many photoresist strippers and residue removers have been proposed for use in the microelectronics field as downstream or back end of the manufacturing line cleaners. In the manufacturing process a thin film of photoresist is deposited on a wafer substrate, and then circuit design is imaged on the thin film. Following baking, the unpolymerized resist is removed with a photoresist developer. The resulting image is then transferred to the underlying material, which is generally a dielectric or metal, by way of reactive plasma etch gases or chemical etchant solutions. The etchant gases or chemical etchant solutions selectively attack the photoresist-unprotected area of the substrate. As a result of the plasma etching process, photoresist, etching gas and etched material by-products are deposited as residues around or on the sidewall of the etched openings on the substrate.

Concerning the claimed inhibitor and the triazoles, Hsu, Chien-Pin Sherman teaches the following:

[0014] While previous attempts to control or inhibit metal corrosion have involved careful controlling of pH and/or using corrosion inhibiting compounds, such as benzotriazole (BT), at relatively low concentrations.

Concerning the primary fatty amine and the sulfoxides, Hsu, Chien-Pin Sherman teaches the following:

17. A cleaning composition of claim 1 comprising water or at least one other organic co-solvent selected from the group consisting of dimethyl

Art Unit: 1751

sulfoxide, sulfolane, diethanolamine, triethanolamine,

2-(methylamino)ethanol and 3-(diethylamino)-1,2-propanediol.

Concerning the tertiary fatty amine, Hsu, Chien-Pin Sherman teaches the following:

21. A cleaning composition of claim 1 comprising tetramethylammonium hydroxide, dimethyl piperidone, triethanolamine, trans-1,2-cyclohexanedia-mine tetraacetic acid and water.

Concerning the polyhydric alcohol, Hsu, Chien-Pin Sherman teaches the following:

[0022] The cleaning compositions of this invention will generally comprise from about 0.05 to about 30 wt. % of the non-ammonium producing strong base; from about 5 to about 99.95 wt. % of the steric hindered amide solvent component; from about 0 to about 95 wt. % water or other organic co-solvent; from about 0 to 40 wt. % steric hindered amines or alkanolamines; about 0 to 40 wt. % organic or inorganic acids; about 0 to 40 wt. % metal corrosion inhibitor compounds such as benzotriazole, catechol, glycerol, ethylene glycol and the like; from about 0 to 5% wt. % surfactant; form about 0 to 10 wt. % metal ion free silicate; from about 0 to 5 wt. % metal chelating agent; and from about 0 to 10 wt. % fluoride compound.(par#75)

Concerning the claimed aliphatic acids, aromatic acid, aliphatic carboxylic acids and the aromatic carboxylic acids, Hsu, Chien-Pin Sherman teaches the following:

[0020] The compositions of the present invention may also be formulated with suitable metal chelating agents to increase the capacity of the

Art Unit: 1751

formulation to retain metals in solution and to enhance the dissolution of metallic residues on the wafer substrate. The chelating agent will generally be present in the compositions in an amount of from about 0 to 5 wt. %, preferably from an amount of from about 0.1 to 2 wt. %. Typical examples of chelating agents useful for this purpose are the following organic acids and their isomers and salts: (ethylenedinitrilo)tetraacetic acid (EDTA), butylenediaminetetraacetic acid, (1,2-cyclohexylenedinitrilo)tetraacetic acid (CyDTA), diethylenetriaminepentaacetic acid (DETPA), ethylenediaminetetrapropionic acid, (hydroxyethyl)ethylenediaminetriacetic acid (HEDTA), N,N,N',N'-ethylenediaminetetra(methylenephosphonic) acid (EDTMP), triethylenetetraminehexaacetic acid (TTHA), 1,3-diamino-2-hydroxypropane-N,N,N',N'-tetraacetic acid (DHPTA), methyliminodiacetic acid, propylenediaminetetraacetic acid, nitrolotriacetic acid (NTA), citric acid, tartaric acid, gluconic acid, saccharic acid, glyceric acid, oxalic acid, phthalic acid, maleic acid, mandelic acid, malonic acid, lactic acid, salicylic acid, catechol, gallic acid, propyl gallate, pyrogallol, 8-hydroxyquinoline, and cysteine. Preferred chelating agents are aminocarboxylic acids such as EDTA, CyDTA and EDTMP.(par#73)

Concerning the ammonium salt, Hsu, Chien-Pin Sherman teaches the following:

[0009] Thus, ammonium hydroxide and ammonium salts can provide nucleophilic and metal-chelating ammonia (NH_3) through the

Art Unit: 1751

equilibrium process described in Equation 1, particularly when other bases such as amines and alkanolamines are added. In the presence of oxygen, metals such as copper can be dissolved/corroded through complex formation with ammonia, as described in Equation 2. Such complex formation can further shift the equilibrium (Equation 1) to the right, and provide more ammonia, leading to higher metal dissolution/corrosion.(par#62)

Concerning the diethylene triamine penta (methylene phosphonic acid), Hsu, Chien-Pin

Sherman teaches the following:

23. A cleaning composition of claim 1 comprising tetramethylammonium hydroxide, dimethyl piperidone, triethanolamine, ethylenediamine tetra(methylene phosphonic acid) and water.(par#29)

Claims 1-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Seijo (US6773873).

Concerning the salt of hydrofluoric acid, preferred hydrofluoric salt and the claimed amide, Seijo teaches the following:

1. A semi-aqueous cleaning formulation for semiconductor devices, comprising: lactic acid, ammonium lactate, water, 1-cyclohexyl-2-pyrrolidinone and N,N-dimethylacetamide and ammonium fluoride.(see claim 1)

Art Unit: 1751

Concerning the base not containing a metal, organic amine compound, primary fatty amine, tertiary fatty amine, heterocyclic amine, aromatic acid, aliphatic carboxylic acids and the aromatic carboxylic acids, Seijo teaches the following:

Organic acids useful in the buffering system of the instant invention include but are not limited to: formic acid, trifluoroacetic acid, propionic acid, butyric acid, valeric acid, heptanoic acid, lactic acid, oxalic acid, malic acid, malonic acid, succinic acid, fumaric acid, adipic acid, benzoic acid, phthalic acid and citric acid. Conjugate bases useful in the buffering system of the present invention include but are not limited to: a salt of the organic acid, ammonia, tetramethylammonium hydroxide, tetraalkylammonium hydroxide, 2-(methylamino)ethanol, monoisopropanolamine, diglycolamine, N,N-dimethyl-2-(2-aminoethoxy)ethanol, 1-(2-aminoethyl)piperidine, 1-(2-hydroxyethyl)piperazine, 1-(2-aminoethyl)piperazine, 1-(3-aminopropyl)-imidazole, 1,8-diazabicyclo[5.4.0]undec-7-ene, N,N,N'-trimethylaminoethanolamine, pentamethyldiethylenetriamine, ethylmorpholine, hydroxyethylmorpholine, aminopropylmorpholine, triethanolamine, and methyldiethanolamine. In a preferred embodiment, the buffering system of the present invention, comprises lactic acid and ammonium lactate.(see col. 4, lines 34-60)

Concerning the resist and the gas plasma processing, Seijo teaches the following:

Ashing is a general term used for a process, which includes removing a

Art Unit: 1751

photoresist coating by exposing the photoresist-coated wafer to an oxygen or hydrogen plasma in order to burn the resist film from the substrate surface. Alternatively, wet stripping typically involves contacting the photoresist-covered substrate with a stripper solution consisting primarily of an organic solvent and an amine. Of the two, plasma ashing is the more popular method for removing photoresist because it is less susceptible to contamination, as the process is carried out in a vacuum.

FIG. 1(d) shows a patterned silicon dioxide layer (12), on the silicon substrate (14) after plasma ashing removal of the photoresist layer having particles and residues (24) left behind from the ashing process.(see cols 1-2)

Concerning the claimed inhibitor, claimed aliphatic acids, triazoles and the amino carboxylic acids, Seijo teaches the following:

The corrosion inhibitor serves to react with the substrate surface, which may be metal or non-metal, to passivate the surface and prevent excessive etching during cleaning. The cleaning agent is a substance that chelates to specific metal or non-metal components to be removed, leading to soluble components that can be readily removed during polishing. The corrosion inhibitor and cleaning agent for the instant invention are preferably a carboxylic acid. More specifically, the carboxylic acid may be chosen from, but not limited to glycine, oxalic acid, malonic acid, succinic acid, citric acid, tartaric acid, gluconic acid, nitrilotriacetic acid, their salts and mixtures thereof. Alternatively, the carboxylic acid

Art Unit: 1751

may be a di, tri or tetra carboxylic acid that preferentially has a nitrogen containing functional group. In the most preferred form, the corrosion inhibitor and the cleaning agent are iminodiacetic acid. Other substances useful as corrosion inhibitors and/or cleaning agents include but are not limited to ethylene-diaminetetraacetic acid (EDTA), benzotriazole (BTA), tolyltriazole, BTA derivatives, such as BTA carboxylic acids, boric acid, fluoroboric acid, cystine, haloacetic acids, glucose, dodecyl mercaptan and mixtures thereof.(see cols. 5-6)

Concerning the polyhydric alcohol, sulfoxides and the lactones, Seijo teaches the following:

In a further embodiment, the present invention relates to a semi-aqueous cleaning formulation useful for removing particles from a semiconductor substrate, wherein said formulation comprises a buffer system, and optionally, a fluoride source and an organic solvent system. Preferably, the organic solvent system is soluble in water. Preferably the organic solvent system comprises at least one polar solvent component. The cleaning formulation may comprise from about 0-95% weight by volume of the solvent system, more preferably between 0 and 80% weight by volume and most preferably between 0 and 70% weight by volume of the organic solvent system. Preferably, at least one component of the organic solvent system comprises an amide or ether functional group. Preferred solvents include but are not limited formamides amide glycol ethers, to N,N-dimethylacetamide, N,N-dimethylformamide,

Art Unit: 1751

1-cyclohexyl-2-pyrrolidinone, N-methylpyrrolidone,
N-cyclohexylpyrrolidone, N-hydroxyethylpyrrolidone, N-octylpyrrolidone,
1,3-dimethylpiperidone, ethylene glycol, propylene glycol, phenoxyethanol,
sulfolane, gamma-butyrolactone, butyrolactone, 1,4-butanediol,
N,N-dimethylacetoacetamide, N-cyclohexylpyrrolidone, N-octylpyrrolidone,
1-phenoxy-2-propanol, phenoxyethanol, dimethylsulfoxide, diethyleneglycol
monobutylether, diethyleneglycol monomethylether, diethylene glycol
monoethylether, diethylene glycol monopropyl ether,
1,3-dimethyl-2-imidazolidinone and mixtures thereof.(see col. 5, lines 19-45)

Conclusion

Claims 1-13 are rejected. It is suggested that the applicant further specify the required constituents in the claims as well as requiring specific weight percentages of these compounds. The use of generic terms such as "base not containing metal" are sufficiently broad as to include millions of compounds. Similarly terms such as "organic acid" would also include large groups of compounds. From the above references it is clear that the use of ammonium fluoride is common in semiconductor cleaning. The addition of common chemicals to the ammonium fluoride is also well-known.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory E. Webb whose telephone number is 571-272-1325. The examiner can normally be reached on 9:00-17:30 (m-f).

Art Unit: 1751

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on 571-272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'G. Webb', with a large, stylized initial 'G'.

Gregory E. Webb
Primary Examiner
Art Unit 1751

gew